

WHAT IS CLAIMED IS:

1 1. An apparatus for measuring physical properties of a plurality of material
2 samples, the apparatus comprising:
3 a moveable sample holder for containing the plurality of material samples;
4 at least one probe for mechanically perturbing the material samples, the at least one
5 probe having an end;
6 at least one actuator connected to the moveable sample holder for translating the
7 material samples in a direction normal to the end so that the material samples contact the at
8 least one probe; and
9 at least one sensor for monitoring the response of the material samples to mechanical
10 perturbation by the at least one probe.

1 2. The apparatus of claim 1, wherein the sensor includes force sensors
2 mechanically linked to the probes.

1 3. The apparatus of claim 2, further comprising shafts that mechanically link the
2 force sensors to the probes.

1 4. The apparatus of claim 3, wherein each of the shafts includes a rigid core and
2 an insulating outer sheathing.

1 5. The apparatus of claim 3, further comprising flexure strips attached to each of
2 the shafts for aligning the probes with the material samples.

1 6. The apparatus of claim 3, further comprising an isolation block module for
2 separating the probes and the force sensors.

1 7. The apparatus of claim 6, wherein the isolation block module has first and
2 second surfaces and cylindrical apertures for containing the shafts, the cylindrical apertures
3 extending from the first surface to the second surface.

1 8. The apparatus of claim 7, further comprising flexure strips for aligning the
2 probes with the material samples, each of the flexure strips attached to the shafts and walls of
3 the cylindrical apertures of the isolation block module.

1 21. The apparatus of claim 17, wherein the test fixture is bonded to at least one of
2 the material samples.

1 22. The apparatus of claim 21, wherein the test fixture is oriented to either extend
2 or compress the material sample during translation of the material samples.

1 23. The apparatus of claim 21, wherein the test fixture is oriented to shear the
2 material sample during translation of the material samples.

1 24. The apparatus of claim 17, wherein the test fixture has a low coefficient of
2 friction with respect to the material samples.

1 25. The apparatus of claim 17, wherein the test fixture includes a loop of a
2 polymeric film.

1 26. The apparatus of claim 17, wherein the test fixture includes an axisymmetric
2 well for shearing one of the material samples.

1 27. The apparatus of claim 26, wherein the axisymmetric well has lateral walls
2 defining a generally cylindrical surface.

1 28. The apparatus of claim 26, further comprising cylindrical rods attached to the
2 moveable sample holder, the rods in substantial axial alignment with probes.

1 29. The apparatus of claim 17, further comprising:
2 first and second reservoirs; and
3 a tube having a generally cylindrical inner bore, the tube providing fluid
4 communication between the first and second reservoirs;
5 wherein the sample holder includes a piston disposed in the first reservoir for forcing
6 one of the material samples initially contained in the first reservoir through the tube and into
7 the second reservoir.

1 30. The apparatus of claim 1, wherein the apparatus is capable of measuring at
2 least one physical property of at least eight samples simultaneously.

1 39. The system of claim 38, wherein the rigid substrate has a low coefficient of
2 friction with respect to the material samples.

1 40. The system of claim 38, wherein the materials are bonded to at least one of the
2 rigid substrate and the end of the at least one probe.

1 41. The system of claim 40, wherein the array of material samples and the probes
2 are oriented either to extend or compress the materials during translation of the array material
3 samples.

1 42. The system of claim 40, wherein the array of material samples and the probes
2 are oriented to shear the materials during translation of the array of material samples.

1 43. The system of claim 35, wherein the array of material samples comprises
2 cylindrical rods coated with materials.

1 44. The system of claim 35, wherein the system is capable of screening at least
2 twelve materials simultaneously.

1 45. The system of claim 35, wherein the system is capable of screening at least
2 forty-eight materials simultaneously.

1 46. The system of claim 35, wherein the system is capable of screening at least
2 ninety-six materials simultaneously.

1 47. The system of claim 35, wherein the system is capable of screening the array
2 of material samples based on measurements of at least two different physical properties.

1 48. The system of claim 47, wherein the test methods used to measure the at least
2 two physical properties are selected from the group consisting of flexure, uniaxial extension,
3 biaxial compression, shear, indentation, stress and strain at failure, toughness, tack, loop tack,
4 viscosity, melt flow indexing, storage modulus, and loss modulus.

1 49. A method of screening a combinatorial library of materials comprising:
2 mechanically perturbing an array of a plurality of materials by contacting at least two
3 of the materials simultaneously with probes; and

4 monitoring the response of the materials to the mechanical perturbations.

1 50. The method of claim 49, wherein monitoring the response of the materials to
2 the mechanical perturbations includes measuring forces exerted on the probes by the material
3 samples as functions of displacement between the probes and the materials.

1 51. The method of claim 50, wherein monitoring the response of the material
2 samples to the mechanical perturbations includes measuring forces exerted on the probes by
3 the materials as functions of time.

1 52. The method of claim 49, further comprising relating the response of the array
2 of materials to Young's modulus, hardness, viscosity, storage modulus, or loss modulus.

1 53. The method of claim 49, wherein the method is capable of screening at least
2 twelve materials simultaneously.

1 54. The method of claim 49, wherein the method is capable of screening at least
2 forty-eight materials simultaneously.

1 55. The method of claim 49, wherein the method is capable of screening at least
2 ninety-six materials simultaneously.

1 56. The apparatus of claim 17, wherein the movable sample holder comprises a
2 frame and at least two cups, which are slidable mounted to the frame, and at least two
3 intersecting substrate pieces, with one of said pieces being attached to the frame and the other
4 of said pieces being attached to the cups.

1 57. The apparatus of claim 17, wherein the moveable sample holder comprises a
2 frame and at least two weights, positioned in receptacles in the frame, with a known surface
3 positioned parallel to the at least one end on which the material sample is deposited.

1 58. The apparatus of claim 17, wherein the test fixture comprises a spring poppet
2 with a cap, said cap having a known surface positioned parallel to the plurality of materials
3 samples.